SYNTAX ZX80®

A PUBLICATION OF **THE HARVARD GROUP**

VOL. 2 NO. 11 ISSN 0273-2696 NOV., 1981

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CAI SHIPS WIDGETS

At presstime, CAI's Bob Swann confirmed reader reports--100's of Widgets shipped. Expect printers in 2 wks, tape drives in 4. Widgets chew up the top 4K of memory--2 for tape and 2 for printer. But--look for CAI to sell 48K add-on memories.

Widgets now cost $79.95, but CAI knocks $10 off for each additional peripheral you buy. Swann says the 21-IC board uses EPROMS permitting software updating. Their tests show Widgets compatible with all setups EXCEPT MicroAce Flicker-Free boards.

CAI announced new policies for better service: product PHOTOS in future ads and no orders taken for undeliverable devices.

MULTIPURPOSE MEMORY EXPANSION

SABRE Systems has developed a multi-purpose memory expansion board to use in a variety of RAM/EPROM combinations. The board contains decode logic plus two 28-pin sockets that can contain the new 2Kx8 CMOS RAM chips or several varieties of EPROM (erasable programmable read-only memory) ICs, such as the 2716, 2732, 2764 or 2532. Jumpers on board accomodate multiple device types and varied IC pinouts on a single plug-in board.

The boards come with either 2K or 4K RAM. They draw 25 mA and are easily powered by the ZX80 power supply.

If you program your own EPROMs, you can store up to 8K of utilities and assembly language programs in each IC slot using 2764s.

SABRE also offers an EPROM programmer that plugs into the ZX80. Wire-wrapped versions will be offered on a limited, as-ordered basis. According to Fayne Sisco of SABRE, a BASIC format is being developed to let users build their EPROM data on tape. SABRE will program EPROMs from tape files.

Contact Fayne Sisco, SABRE Systems, 1719 Autrey, Deer Park, TX, 77536.

ANNIVERSARY ISSUE

SYNTAX ERRORS: INSIGHT's telephone number in their classified ad (Oct. 81 p.16) should read 616/684-7868. Jon Passler noticed an error in his 8K Roundoff routine (Oct.81). To use three decimal places, change 0 to 00 (LEN N$ TO). Error is in second paragraph of text.

CHANGES TO AMAZING ACTIVE DISPLAY

John Sampson of College Point, NY, called in response to the letter in the Oct.81 issue about The Amazing Active Display. With these changes to the version on p. 68 of Making the Most of Your ZX80, which correct typos and convert to American TV, the program runs on 4K ROM and 1K RAM.

In line 30 defining M$, change the 61st and 62nd hex digits (DE) to FE. Change the 75th and 76th (38) to 20. Change the 111th and 112th (EC) to FC.

INVERSE BIG CHARACTERS

To print 8x size characters in reverse video, change these lines from Big Characters (Dec.80):

```
 140 PRINT " ";
 160 PRINT CHR$(128);
```

Print 4x size characters in reverse video by modifying Son of Big Characters (Feb.81). Enter the original decimal listing:

0 4 6 2 5 131 8 135 7...

in reverse order:

128 132 134 130 133 3 136...

Paul Ezra, San Diego, CA

R.B. Turner plans to interface his 4K/2K MicroAce to the MM57109 programmable calculator chip to provide many scientific calculations. He's also working on an 8255 peripheral interface adapter I/O chip for programmable input/output from the MicroAce to 3 I/O ports. He wants offer PC board kits to SYNTAX readers. For more details, contact Mr. Turner at 109 Chesney Ln, Columbia, SC 29209.

SINCLAIR'S PRINTER SHOWN IN US

Clive Sinclair of Sinclair Research demonstrated his ZX81 printer at the the US introduction of the ZX81 computer in Boston on Oct.7. Although in production in England, the printers cannot be imported into the US until they get FCC approval. Sinclair expects approval near the end of the year.

This sample hardcopy output from a ZX81 on a Sinclair printer shows its print size and readability. The aluminized paper is about 4 inches wide. The program draws the curve printed above it and takes more than 1K RAM.

```
  10 DIM C(64)
  20 FOR V=1 TO 64
  30 LET C(V)=22+20*(SIN ((V-1)/
32*PI))
  40 NEXT V
 100 FOR G=1 TO 64
 110 PLOT G-1,C(G)
 115 NEXT G
 117 GOSUB 1000
 120 COPY
 125 GOSUB 1000
 130 LLIST
 135 FOR H=1 TO 6
 140 LPRINT
 145 NEXT H
1000 IF INKEY$<>"" THEN RETURN
1010 GOTO 1000
```

This version runs on a 1K ZX81:

```
  10 FOR X=0 TO 64 STEP 8
  20 FOR V=X TO 63+X
  30 PLOT V-64*INT X/64,22+20*(S
IN V/(32*PI))
  40 NEXT V
  50 NEXT X
```

To make a longer series of sine curves, add 15 CLS

HARDWARE HINTS

Herb Sturges, Orinda, CA, called in these hardware tips:

If your ZX80 overheats easily, you can increase the capacity of its aluminum heat sink to dissipate heat with a little paint and a coping saw. Aluminum painted with flat black paint has 20 times polished aluminum's ability to release heat. Remove the heat sink, paint it black, and let it dry before reinstalling. Then use a small hand coping saw to cut through the black lines on the top of the case so all that heat can escape. **Caution--if you use an electric saw, use a coarse-toothed blade, because the case will melt under the friction of a fine-toothed blade. Heat sink compound (silicon and zinc oxide) between the regulator and the heat sink also helps.

To minimize the danger of static electricity zapping your ICs, ground the ZX80 edge connector with aluminum foil. Simply fold the foil over the top and bottom edges and affix with cellophane tape.

To improve insulation under the regulator, replace the cardboard with fiberglass of the same size and thickness.

To label big keyboards: Remove the ZX80 keyboard map (that little sheet under the front rivets) and have it photocopied in color. Cut out squares and paste to keys with rubber cement or epoxy.

REDUCE 4K LOADING NOISE

4K ROM users: instead of building our Cassette Eavesdropper (Dec.80) to reduce loading noise, try a dual mini-plug from Radio Shack (part # 274-310). It's just $1.59 and does the same thing in a small package. Tip from Marty Irons, Goshen, NY.

SUPER MONZXER

This 8K/16K adventure game of survival challenges you with man-eating spiders, giant bats, pits and monzxers. You are in a cave with 5 levels of 20 rooms each. With only 3 arrows, you must kill three monzxers to emerge alive.

If you enter a spider room (2 per level), you are caught in their web and must shoot them, but they are gone after you shoot them.

Pits (2 per level) drop you a level if you are at level 4 or higher, but the room you land in may not be safe. Level 5 contains bottomless pits (ending the game).

If you enter a room with bats (2 per level), they carry you to another room (perhaps not safe) on the same level and return.

One room in the cave contains a sword. If you go in that room, the sword is yours to keep.

Three monzxers lurk in the cave, not necessarily on different levels. If you enter their room, they will instantly kill you unless you have a sword. Kill a monzxer by shooting an arrow into its room.

The computer warns you of nearby threats. One room away from a pit, it prints 'I FEEL A DRAFT.' One room from a spider it says 'I SEE COBWEBS.' One room from bats you read 'BATS NEARBY.' One or two rooms from a monzxer, your guide says 'I SMELL A MONZXER.'

The computer gives your position and which 3 rooms there are tunnels to on the same level. You can move or shoot, then specify the room to enter or the arrow's path. The arrow will not fall in a pit, be carried by bats, or stop in a spider's room. If its path returns it to your room, it kills you.

The game ends when you kill all 3 monzxers, shoot yourself, a spider or a monzxer eats you, or you fall in a bottomless pit. To exit early, hit BREAK when it asks "MOVE OR SHOOT?"

I'd like to hear from others

about this program or anyone having trouble with the 16K RAM dumping out programs. I wrote a program to play Monopoly against the computer; please write if you're interested.

Andrew Q. Banta, R.D. #7
Bethlehem, PA, 18015

(For a description of line and subroutine functions, send us a self-addressed stamped envelope.--AZ)

```
  1 RAND
 10 PRINT AT 10,4;"AN A. Q. BAN
TA PRODUCTION"
 20 PAUSE 300
 25 POKE 16437,255
 30 CLS
 50 PRINT AT 10,20;"SUPER"
 60 PRINT AT 12,18;"MONZXER"
 70 FOR I=3 TO 37
 80 FOR J=11 TO 19
 90 PLOT J,I
100 NEXT J
110 NEXT I
120 FOR I=16 TO 24
130 FOR J=8 TO 22
140 PLOT J,I
150 NEXT J
160 NEXT I
170 FOR I=22 TO 32
180 PLOT 6,I
190 PLOT 24,I
200 NEXT I
210 PLOT 5,22
220 PLOT 7,22
225 PLOT 7,21
230 PLOT 23,22
235 PLOT 25,22
240 PLOT 23,21
245 PLOT 25,21
250 PLOT 9,35
255 PLOT 10,35
265 PLOT 10,36
270 PLOT 20,36
275 PLOT 20,35
280 PLOT 21,35
285 FOR I=14 TO 16
290 FOR J=3 TO 16
295 UNPLOT I,J
300 NEXT J
305 NEXT I
307 PLOT 23,33
312 PLOT 7,33
315 PLOT 7,32
320 FOR I=5 TO 25
325 IF I=14 THEN LET I=17
330 PLOT I,3
335 NEXT I
338 FOR I=6 TO 24
340 IF I=14 THEN LET I=17
342 PLOT I,4
345 NEXT I
350 PRINT AT 21,3;"""  """
352 PRINT AT 21,9;"""  """
355 PRINT AT 7,5;"Q"
357 PRINT AT 7,9;"Q"
360 PRINT AT 9,5"      "
365 PRINT AT 5,22;" ----/"
370 PRINT AT 4,28;"/"
375 PRINT AT 3,29;"/"
380 PRINT AT 2,30;"/"
382 UNPLOT 8,17
385 UNPLOT 8,16
387 UNPLOT 9,16
390 UNPLOT 21,16
392 UNPLOT 22,16
395 UNPLOT 22,17
397 PAUSE 600
398 POKE 16437,255
400 DIM R(3,101)
401 DIM A(6)
402 FOR I=1 TO 3
403 LET R(I,101)=101
404 NEXT I
406 LET SW=0
407 LET DM=0
408 FOR L=0 TO 80 STEP 20
410 FOR I=1 TO 20
415 LET K=L+I
420 FOR J=1 TO 3
422 LET J1=J
425 IF J1<INT ((I-1)/5) THEN LE
T J1=J1-1
430 IF R(J,K)>0 THEN GOTO 495
435 LET G=INT (RND*5)+J1*5+L+1
436 FOR M=1 TO 5
437 IF R(J,L+M+INT ((I-1)/5)*5)
=G THEN GOTO 435
438 NEXT M
440 FOR H=1 TO 3
445 IF R(H,G)=K THEN GOTO 435
450 IF R(H,G)=0 THEN GOTO 465
455 NEXT H
460 GOTO 435
465 LET R(J,K)=G
490 LET R(H,G)=K
495 NEXT J
```

```
 500 NEXT I
 510 NEXT L
 525 LET YR=INT (RND*20)+1
 535 LET S1=6
 610 DIM X(36)
 620 DIM T(30)
 630 DIM C(30)
 640 DIM Q(30)
 650 DIM W(3)
 660 DIM S(10)
 670 DIM B(10)
 680 DIM P(10)
 690 LET DM=0
 695 LET SW=0
 700 LET SR=INT (RND*100)+1
 710 FOR I=1 TO 3
 720 LET W(I)=INT (RND*100)+1
 725 IF W(I)=YR THEN GOTO 720
 730 NEXT I
 740 FOR I=1 TO 9 STEP 2
 745 FOR J=0 TO 1
 750 LET S(I+J)=(INT (RND*20)+1)
+20*INT (I/2)
 760 LET B(I+J)=(INT (RND*20)+1)
+20*INT (I/2)
 770 LET P(I+J)=(INT (RND*20)+1)
+20*INT (I/2)
 780 NEXT J
 790 NEXT I
 800 FOR I=0 TO 9
 810 FOR J=1 TO 3
 820 LET T(I*3+J)=R(J,S(I+1))
 830 LET C(I*3+J)=R(J,B(I+1))
 840 LET Q(I*3+J)=R(J,P(I+1))
 850 NEXT J
 860 NEXT I
 870 FOR I=0 TO 2
 880 FOR J=1 TO 3
 890 LET X(I*3+J)=R(J,W(I+1))
 900 FOR L=1 TO 3
 910 LET GG=((J-1)*3)+(I*9)+L+9
 920 LET X(GG)=R(L,X(I*3+J))
 930 NEXT L
 950 NEXT J
 960 NEXT I
1000 CLS
1010 LET YL=INT ((YR-1)/20)+1
1020 PRINT "YOU/RE ON LEVEL ";YL
1030 PRINT "YOU/RE IN ROOM ";YR-
(YL-1)*20
1032 IF YR=SR THEN PRINT "THERE
IS A SWORD IN THE ROOM"
1037 IF YR=SR THEN LET SW=1
1040 FOR I=1 TO 30
1050 IF YR=T(I) THEN GOTO 1080
1060 NEXT I
1070 GOTO 1090
1080 PRINT "I SEE COBWEBS"
1090 FOR I=1 TO 36
1100 IF YR=X(I) THEN GOTO 1130
1110 NEXT I
1120 GOTO 1140
1130 PRINT "I SMELL A MONZXER"
1040 FOR I=1 TO 30
1150 IF YR=Q(I) THEN GOTO 1180
1160 NEXT I
1170 GOTO 1190
1180 PRINT "I FEEL A DRAFT"
1190 FOR I=1 TO 30
1200 IF YR=C(I) THEN GOTO 1230
1210 NEXT I
1220 GOTO 1240
1230 PRINT "BATS NEARBY"
1240 FOR I=1 TO 3
1250 IF YR=W(I) THEN GOTO 1280
1260 NEXT I
1270 GOTO 1300
1280 PRINT "THERE IS A MONZXER I
N YOUR ROOM"
1281 IF SW=1 THEN GOTO 1285
1282 PRINT "AND IT ATE YOU"
1284 GOTO 3000
1285 PRINT "BUT YOU KILLED IT WI
TH YOUR SWORD"
1290 PAUSE 300
1291 POKE 16437,255
1292 LET DM=DM+1
1294 IF DM=3 THEN GOTO 2990
1297 LET W(I)=101
1298 GOTO 870
1300 FOR I=1 TO 10
1310 IF YR=B(I) THEN GOTO 1340
1320 NEXT I
1330 GOTO 1380
1340 CLS
1350 LET YR=(INT (RND*20)+1)+(YL
-1)*20
1360 PRINT "BATS TOOK YOU TO ROO
M ";YR-(YL-1)*20
1370 GOTO 1010
1380 FOR I=1 TO 10
1390 IF YR=S(I) THEN GOTO 1470
1400 NEXT I
1410 GO TO 1430
1420 PRINT "THERE IS A SPIDER IN
 YOUR ROOM"
1430 FOR I=1 TO 10
1440 IF YR=P(I) THEN GOTO 1470
1450 NEXT I
1460 GOTO 1540
```

```
1470 IF YL=5 THEN GOTO 1520
1480 CLS
1490 PRINT "YOU FELL IN A PIT"
1500 LET YR=YR+20
1510 GOTO 1010
1520 PRINT "YOU FELL INTO A BOTT
OMLESS PIT"
1530 GOTO 3000
1540 PRINT "TUNNELS TO ROOMS ";
1550 FOR I=1 TO 3
1560 PRINT " ";R(I,YR)-(YL-1)*20
1570 NEXT I
1580 PRINT
1590 PRINT "MOVE OR SHOOT"
1600 PAUSE 900
1605 POKE 16437,255
1610 LET K$=INKEY$
1620 IF K$="M" THEN GOTO 1650
1630 IF K$="S" THEN GOTO 2000
1640 GOTO 1600
1650 FOR I=1 TO 10
1652 IF YR=S(I) THEN GOTO 1657
1654 NEXT I
1656 GOTO 1659
1657 PRINT "THE SPIDER GOT YOU"
1658 GOTO 3000
1659 PRINT "WHICH ROOM?"
1660 INPUT YR1
1670 FOR I=1 TO 3
1680 IF YR1=R(I,YR)-(YL-1)*20 TH
EN GOTO 1720
1690 NEXT I
1700 PRINT "YOU HIT A WALL"
1710 GOTO 1650
1720 LET YR=YR1+(YL-1)*20
1730 GOTO 1000
2000 LET S1=S1-1
2005 FOR I=1 TO 10
2010 IF YR=S(I) THEN GOTO 2035
2020 NEXT I
2030 GOT0 2060
2035 PRINT "YOU KILLED THE SPIDE
R"
2040 PAUSE 300
2042 POKE 16437,255
2045 LET S(I)=101
2050 GOTO 800
2060 CLS
2070 PRINT "MAKE A LIST OF 5 ROO
MS FOR THE ARROWS FLIGHT"
2080 FOR I=2 TO 6
2090 INPUT A(I)
2100 PRINT A(I)
2105 LET A(I)=A(I)+(YL-1)*20
2110 NEXT I
2120 LET A(1)=YR
2130 FOR I=2 TO 6
2140 FOR J=1 TO 3
2150 IF A(I)=R(J,A(I-1)) THEN GO
TO 2180
2160 NEXT J
2165 LET J=INT (RND*3)+1
2170 LET A(I)=R(J,A(I-1))
2180 FOR J=1 TO 3
2190 IF A(I)=W(J) THEN GOTO 2220
2200 NEXT J
2210 GOTO 2230
2220 PRINT "YOU SLEW A MONZXER"
2221 LET W(J)=101
2222 PAUSE 300
2223 POKE 16437,255
2224 LET DM=DM+1
2225 IF DM=3 THEN GOTO 2990
2226 IF S1=0 THEN GOTO 2283
2228 GOTO 870
2230 IF NOT A(I)=YR THEN GOTO 22
60
2240 PRINT "YOU SHOT YOURSELF"
2250 GOTO 3000
2260 NEXT I
2270 PRINT "YOU MISSED THE MONZX
ER"
2280 PAUSE 300
2281 POKE 16437,255
2283 IF S1=0 THEN PRINT "YOU ARE
OUT OF ARROWS"
2285 IF S1=0 THEN GOTO 3000
2290 GOTO 1000
2990 PRINT "NO MORE MONZXERS, YO
U WIN"
3000 PAUSE 600
3002 POKE 16437,255
3005 CLS
3010 PRINT AT 10,10;"PLAY AGAIN?
"
3020 PAUSE 900
3022 POKE 16437,255
3030 LET K$=INKEY$
3040 IF K$="Y" THEN GOTO 3070
3050 IF K$="N" THEN STOP
3060 GOTO 3020
3070 PRINT AT 10,6;"SAME TUNNEL
SET?"
3080 PAUSE 900
3085 POKE 16437,255
3090 LET K$=INKEY$
3100 IF K$="Y" THEN GOTO 525
3110 IF K$="N" THEN GOTO 400
3120 GOTO 3080
Syntactic Sum:  41313, 8K
```

NEW 8K ROM POTPOURRI

As you know, Sinclair's first 8K ROM has a few bugs. By the time you read this, however, Sinclair should have received updated, corrected ROMs which contain four primary modifications:

1--The INPUT routine (at 0EE9h in both 8K ROMs) contains a CALL 14A3h as the third instruction. This subroutine, actually part of the CLEAR routine, clears the memory area used to hold keyboard input. It sets the system variables STKEND and STKBOT equal to E*LINE, the pointer to the first byte of the input buffer. The CALL has been added at 0EEFh (new ROM). Thus, all code up to this point is identical in both 8K ROMs. Beyond this address, all code in the new ROM is offset by three bytes.

2--In the old 8K ROM, a bug in the PAUSE routine (at 0F32 in new ROM, 0F2F in old ROM) caused the machine to crash if you didn't POKE 16437, 255 after PAUSEing. The offending instruction (at 0F3D in old ROM) was a SET 7,(IY+35) where IY held 4000h. This has been replaced with LD (IY+35),FE. Because of the three bytes added to the INPUT routine, the LD is at 0F40h in the new ROM. Now you no longer need to POKE 255 to 16437 every time you PAUSE with the new 8K ROM.

3--The evaluation routines are changed. The old code (at 102Fh in the new ROM) tested bit 6 of the system FLAGS. Originally a BIT instruction, it is now:

```
LD A,(4001)
CP #C0
```

This change moves all code beyond 1032h forward another byte.

4--The floating-point to 16-bit conversion routine has been changed. In the new ROM, three instructions have been deleted:

```
LD A,H
SUB L
LD H,A
```

Although I have not fully analyzed the new 8K ROM, I suspect that these three instructions, originally located at 1734h in the old ROM, are the cause of users' troubles with numerical calculations. The end result of this deletion is that all code beyond 1737h is moved back three bytes.

These changes result in the following new 8K ROM map:

Loc. (hex)	
0000	NMI Off Jump to Initialization
0008	Restarts
0066	NMI (Slow) Handler
007E	Keyboard Decode Table
00CC	Function (Keyboard) Decode Table
00F3	Graphics (Keyboard) Decode Table
0111	Command (Keyboard) Decode Table
01FC	I/O Routines
03A2	Initialization and Editing
0562	Mode/Edit Table
0575	List, etc.
0C29	Command Offset Table
0C48	Command Pointer Table
0D16	Syntax Class Table
0D1D	Class Evaluation Routines
0DAB	Command Handlers
0F55	Expression Evaluator
1263	String Slicing
14D9	Decimal to Floating Point Conversion Routine
158A	Floating Point to 16-Bit Conversion Routine
174C	Handlers for the Four Basic Arithmetic Operators
1923	Function Address Table
199D	Calculator
1A45	Function Evaluation Routines
1E00	Character Generator

David Ornstein, Newton, MA

ZX81 2K RAM UPGRADE: Blair Evans (Arlington, MA) told us of a 2K x 8 RAM chip that will fit the ZX81. Part #6116 from Hitachi and others.

SOFTWARE REVIEW: ZETA SOFTWARE

Here's an unusual review: a free sample. We feel that one of Zeta Software's best points is the thorough documentation that comes with each program, so with Zeta's permission we are reprinting one of their programs so you can see for yourself just what you get. Jon Bobst of Zeta customized this program, MCD Name Changer, for SYNTAX. It is available in his catalog (#45) in a general form. The comments after the semicolons are explanations of function.

Zeta currently offers 45 4K/1K programs, including games, educational programs, and programs to help you learn how to use your computer. No listing costs over $5; most are $1. You can get programs on cassette for an extra $5. Programs for 8K ROM machines are in the works. Jon is also working on a SciFi series called ZetaTrek, to culminate in one mammoth 8K/16K program. For more information and a free catalog, contact Jon Bobst at Zeta Software, P.O. Box 3522, Greenville, SC, 29608-3522, 803/246-1741.

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```
  1 REM [shifted A's] etc.          ;118 shifted A's for MCPause
  2 REM [shifted A's] etc.          ;71 shifted A's for MCD changer
  3 REM B                           ;Buffer against listing 1 or 2
```

POKE 16403,3 On edit line with cursor on line 3 to bump 1 and 2 REMs off-screen.

```
 10 POKE 16421,24                   ;Lie about number of free rows
 20 FOR X=1 TO 5                    ;Drop display down 5 rows
 30 PRINT
 40 NEXT X
100 FOR X=16427 TO 16445            ;Manual input loop
110 INPUT Y
120 POKE X,Y
130 PRINT PEEK(X),
140 NEXT X
150 INPUT A$                        ;Input stop to allow table check
160 FOR X=16446 TO 16544            ;Automatic input loop to complete
170 POKE X,PEEK(X-16116)            ;1 REM with ROM values in
180 NEXT X                          ;addresses 330-428
```

GO TO 100 Enter 19 values:

205	51	64	96
201	205	173	1
62	0	61	200
50	52	64	6
6	16	254	

Hit NL to continue filling in 1 REM with ROM values. Edit out lines 150-180.

```
100 FOR X=16549 TO 16619
```

GO TO 100 Enter 71 values from code sheet into 2 REM. If you happen to hit HOME, LIST, or move cursor above line 3, move cursor down a few lines and POKE 16403,3 to bump 1 and 2 off

again.

Edit out lines 100-140.

```
  50 PRINT "AAAsAsssAsAsssAsAAAAAssAssAsssA"   ;A=shifted A,
  60 PRINT "AssssAsAssAAssAsssAsssAsAssAsA"    ;s=1 space
  70 PRINT "sAssssAsssAsAsAsssAsssAAAsssA"
  80 PRINT "ssAsssAsssAssAAsssAsssAsAssAsA"
  90 PRINT "AAAsssAsssAsssAsssAsssAsAsAsssA"
 100 PRINT
 110 PRINT "AAAAAAAAAAAAAA"          ;14 shifted A's
 120 PRINT "MC DISPLAY BYA"          ;Last A is shifted
 130 PRINT "  JON BOBST  A"
 140 PRINT "ZETA SOFTWAREAAAAAAAA    ;18 shifted A's and 1 shifted F
AAAAAAAAAAF"                         ;(this char. must be in display)
 150 FOR X=1 TO 9                    ;Filler loop for 24-row display
 160 PRINT
 170 NEXT X
 200 LET P=PEEK(16396)+PEEK(16397)   ;Address of 1st chr in display
*256+6
 210 POKE 16549,P-(P/256)*256        ;Load 2 REM with that address
 220 POKE 16550,P/256
 300 LET D=USR(16553)                ;Call subroutine in 2 REM
 400 STOP                            ;Hit BREAK to exit MCD change
                                      loop
```

SAVE RUN

CODE SHEET--MCD Changer

ADDRESS		+1	+2	+3	
16549	0	0	0	0	;Address storage
16553	229	42	165	64	;Initialize subroutine
16557	34	167	64	225	
16561	229	42	167	64	;This section gets present
16565	35	126	254	0	;address, points to next,
16569	40	27	254	7	;looks in it to see what it
16573	32	6	42	165	;is, and changes chr
16577	64	34	167	64	;accordingly
16581	126	254	9	40	
16585	8	254	128	32	
16589	12	54	9	24	
16593	8	54	128	24	
16597	4	6	5	16	;Display synchronizer
16601	254	34	167	64	;Save present address
16605	62	2	50	52	;Load 1 REM timer with value
16609	64	225	205	43	;Call subroutine in 1 REM
16613	64	124	254	-3	;Test for BREAK key, RETURN
16617	32	198	201		;to BASIC if, loop back if
					;not

NOTES: 71 values into 2 REM addresses 16549-16619.

The $149.95 personal computer.

Introducing the Sinclair ZX81

If you're ever going to buy a personal computer, now is the time to do it.

The new Sinclair ZX81 is the most powerful, yet easy-to-use computer ever offered for anywhere near the price: only $149.95* completely assembled.

Don't let the price fool you. The ZX81 has just about everything you could ask for in a personal computer.

A breakthrough in personal computers

The ZX81 is a major advance over the original Sinclair ZX80—the world's largest selling personal computer and the first for under $200.

In fact, the ZX81's new 8K Extended BASIC offers features found only on computers costing two or three times as much.

Just look at what you get:

- Continuous display, including moving graphics
- Multi-dimensional string and numerical arrays
- Mathematical and scientific functions accurate to 8 decimal places
- Unique one-touch entry of key words like PRINT, RUN and LIST
- Automatic syntax error detection and easy editing
- Randomize function useful for both games and serious applications
- Built-in interface for ZX Printer
- 1K of memory expandable to 16K

The ZX81 is also very convenient to use. It hooks up to any television set to produce a clear 32-column by 24-line display. And you can use a regular cassette recorder to store and recall programs by name.

*Plus shipping and handling. Price includes connectors for TV and cassette, AC adaptor, and FREE manual.

If you already own a ZX80

The 8K Extended BASIC chip used in the ZX81 is available as a plug-in replacement for your ZX80 for only $39.95, plus shipping and handling—complete with new keyboard overlay and the ZX81 manual.

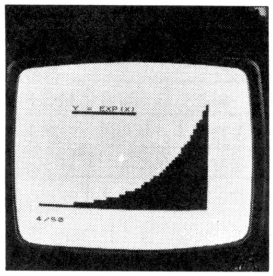
So in just a few minutes, with no special skills or tools required, you can upgrade your ZX80 to have all the powerful features of the ZX81. (You'll have everything except continuous display, but you can still use the PAUSE and SCROLL commands to get moving graphics.)

With the 8K BASIC chip, your ZX80 will also be equipped to use the ZX Printer and Sinclair software.

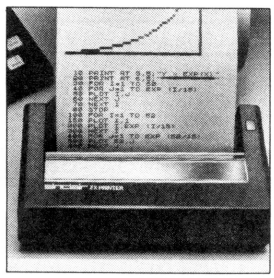
Warranty and Service Program**

The Sinclair ZX81 is covered by a 10-day money-back guarantee and a limited 90-day warranty that includes free parts and labor through our national service-by-mail facilities.

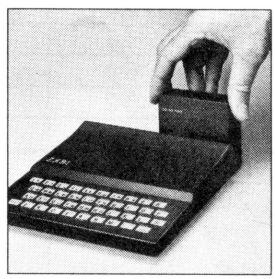
**Does not apply to ZX81 kits.



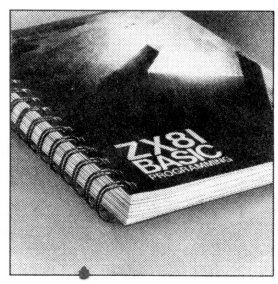
NEW SOFTWARE: Sinclair has published pre-recorded programs on cassettes for your ZX81, or ZX80 with 8K BASIC. We're constantly coming out with new programs, so we'll send you our latest software catalog with your computer.



ZX PRINTER: The Sinclair ZX Printer will work with your ZX81, or ZX80 with 8K BASIC. It will be available in the near future and will cost less than $100.



16K MEMORY MODULE: Like any powerful, full fledged computer, the ZX81 is expandable. Sinclair's 16K memory module plugs right onto the back of your ZX81 (or ZX80, with or without 8K BASIC). Cost is $99.95, plus shipping and handling.



ZX81 MANUAL: The ZX81 comes with a comprehensive 164-page programming guide and operating manual designed for both beginners and experienced computer users. A $10.95 value, it's yours free with the ZX81.

The $99.95 personal computer.

Introducing the ZX81 kit

If you really want to save money, and you enjoy building electronic kits, you can order the ZX81 in kit form for the incredible price of just $99.95.* It's the same, full-featured computer, only you put it together yourself. We'll send complete, easy-to-follow instructions on how you can assemble your ZX81 in just a few hours. All you have to supply is the soldering iron.

How to order

Sinclair Research is the world's largest manufacturer of personal computers.

The ZX81 represents the latest technology in microelectronics, and it picks up right where the ZX80 left off. Thousands are selling every week.

We urge you to place your order for the new ZX81 today. The sooner you order, the sooner you can start enjoying your own computer.

To order, simply call our toll free number, and use your MasterCard or VISA.

To order by mail, please use the coupon. And send your check or money order. We regret that we cannot accept purchase orders or C.O.D.'s.

CALL 800-543-3000. Ask for operator #509. In Ohio call 800-582-1364. In Canada call 513-729-4300. Ask for operator #509. Phones open 24 hours a day, 7 days a week. Have your MasterCard or VISA ready.

These numbers are for orders only. For information, you must write to Sinclair Research Ltd., One Sinclair Plaza, Nashua, NH 03061.

sinclair

AD CODE 11SX	PRICE†	QTY.	AMOUNT
ZX81	$149.95		
ZX81 Kit	99.95		
8K BASIC chip (for ZX80)	39.95		
16K Memory Module (for ZX81 or ZX80)	99.95		
Shipping and Handling	4.95		$4.95
To ship outside USA add $10.00			
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MAIL TO: Sinclair Research Ltd., One Sinclair Plaza, Nashua, NH 03061.

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† U.S. Dollars

DEAR EDITOR:

The ZX-Microfair in London on September 26 brought out over 5000 attendees. Many die-hards stood in the London drizzle for 2 hours.

Inside about 50 stands dealt with ZX80 systems--lots of books and magazines, hardware add-ons and games. At least 3 chess programs are running. I expect the best to be from ARTIC Computing, 396 James Reckitt Ave., Hull, UK, £10.

The Microfair also launched my new book, Understanding the ZX81 ROM. It teaches the elements of Z80 machine code language programming through the 8K ROM program. It applies generally to the 8K ROM, so it's just as good for 8K ZX80s as ZX81s. The floating point routines are not discussed. The book retails in the UK for £8.95 + 50p postage. Melbourne House will surely advertise it, but I could supply copies to SYNTAX readers at $22 per copy, including airmail, 2 1/2 week delivery.

Ian Logan, 24 Nurses Ln, Skellingthorpe, Lincoln, UK LN6 0TT

Last week my MicroAce 8K ROM finally arrived (after 2 months). It has the same bug that Sinclair's had trouble with. I wrote MicroAce about this, but thought I should inform SYNTAX readers. Is MicroAce going to make good on this?

In June's SYNTAX you quote David Ornstein as saying the ZX80 can accommodate 48K external RAM. This agrees with the reverse of the ZX80 schematic, but disagrees with Video Display Notes (p.8) and Beginners' ROM and RAM Addresses (p.15, both May 81) and my own experiences in trying to decode address 15 for memory expansion. This won't work without internal hardware changes (ROM decoding). I'm not sure how to do this without more info on the display routine.

John L. Oliger, Indianapolis, IN

Kevin Hawkins, MicroAce's new manager, Santa Ana, CA, says he doubts that MicroAce will replace their faulty ROMs. If they did, new ROMs would not be ready until July or August of 1982 because of the time needed to make semiconductor components. And Sinclair may try to keep MicroAce from selling any 8K ROMs, bugs or no bugs. The legal situation should shake out in a few weeks, according to Kevin.

Ornstein verifies the need to add ROM decoding. On a ZX80, generate a signal to go low when A13, A14 & A15 are low and substitute it for A14' at the input (pin 13) of IC13. Remember to pull NOT RAM CS to +5V at the edge connector.

On the ZX81, pin 23B of the edge connector is NOT ROM CS. Use it to externally decode ROM by pulling 23B to +5V except when you want to select ROM.--KO

I've had a 3K MicroAce since last January. My only problem is that the voltage regulator gets hot and the CPU goes ape. I mounted the unit under the printed circuit board of a Jameco Electronics JE 610 keyboard, parallel wiring the keys and cutting PCB traces where necessary to disable the sockets set up for ICs on an ASCII basis. I also moved the voltage regulator as far away from the CPU as possible. Now it works well.

Bill Harral, San Pablo, CA

Will the 8K floating point let you use numbers larger than 32767? Can it be used with the additional 16K memory expansion?

Charles N. Ryan, Sao Paulo, Brazil

You can use numbers up to 65535 on the 8K ROM before you get subscript out of range error. Arithmetic overflow errors do not occur until the number calculated exceeds about 10^{38}. The 8K ROM plus the 16K RAM make a powerful larger system.--AZ

ZX81--THE NEW STANDARD

While other manufacturers lower the prices on machines that won't sell, Clive Sinclair uses technology to give more for less. For only $149, you now get 8K BASIC, continuous display, the choice of channel 2 or 3 and a newly styled case.

If you just want a computer to use, the smaller ZX81 addresses some user problems. The 8K ROM bugs are fixed. Also, the dual-channel (2 & 3) modulator avoids problems near TV transmitters since you can switch to the unused band. You get less screen interference because the new case provides overlapping metallization for better shielding. You'll find new key names, too: Rubout becomes Delete and Newline becomes Enter. I like the new keyboard feel--soft with a longer travel than the ZX80.

Hardware hackers will enjoy the fully socketed ICs and the five SCREWS that hold the case together. (Three are hidden beneath the feet, which attach with double-sided tape.) Inside, you'll find 28-pin sockets on both RAM and ROM. This allows plug-in upgrade to 2K memory using the 4816 chip and changing one jumper. The keyboard attaches with 8- & 5-pin CONNECTORS. Also, pin 23B of the connector now carries the NOT ROM CS line so you can add external ROM select.

While continuous display is nice, you'll really like having a choice of FAST or SLOW mode. You may be surprised to learn how much you depended on screen-flicker as a typing clue. (I use FAST--with flicker--to type in programs, the SLOW--no flicker--to run them.)

Problems remaining from the ZX80: partial address decoding for memory and port locations, non-standard edge connectors, and no direct video output.

All told, ZX81 represents an improvement on the 8K ZX80 at a substantially lower price.--KO

FIND CLEAN TAPE ON 8K

Quickly find the unused section of tape for SAVEing 8K programs on multi-program tapes on any RAM size. Enter this program after the last one saved:

```
    5 REM "FRESH"
SAVE "FRESH"
```

Next time, rewind the tape, type LOAD "FRESH" and play.

When the screen displays code 0/0, stop the tape. Rewind just enough so that you can save the new program over and erase FRESH. SAVE a new FRESH program at the end.

John Andrews, San Jose, CA

ZX81 AND 16K RAM SCHEMATICS

A new company, Heuristics, is the exclusive distributor of ZX81 & 16K RAM pack schematics. They also plan ZX81 hardware and software. For info and a free catalog, write David Ornstein, Heuristics, 25 Shute Path, Newton, MA, 02159.

BOOK REVIEW: THE ZX81 COMPANION

Title: The ZX81 Companion
By: Bob Maunder
From: LINSAC, 68 Barker Road, Middlesborough, TS5 5ES UK
Price: £7.95 (about $16.00)

Bob Maunder's new book is very different from The ZX80 Companion. It aims to appeal to every ZX81 owner, but more to "students" of computing whether at home or at school.

Bob Maunder is the head of the computing department at Hartlepool College. His work there with the ZX80 and ZX81 has led him to concentrate his writing on the ZX81 in the education field.

The book is divided into four sections:

Chapter 1--Graphics and Realtime Techniques. A good chapter that goes into the use of ZX81 graphics to quite an advanced stage. You are shown how to draw lines, circles and curves. Several good games contain many useful ideas.

Chapter 2--Information Processing. In this 31-page chapter, Maunder tried to show just how much business computing can be performed with a 16K ZX81. He develops a very complicated BASIC membership program stage by stage. The final program enables a membership secretary to hold 80 records of 102 bytes each, allowing him to access 80 names, addresses and "interests" in several ways. Overall this program is successful, but I feel that the chapter's main advantage is in introducing you to such advanced BASIC lines as:

```
5490 LET R$(RN,66 TO 73)=P$
```

which is daunting to beginners.

Chapter 3--Education. This chapter primarily discusses writing "likeable" programs. Several more game programs here are all interesting but not very advanced. Generally, this chapter isn't very successful.

Chapter 4--The Monitor. To widen the book's appeal, Maunder included 7 pages of text about the 8K monitor. In such a small section, however, he does little but introduce the subject. He explains hexadecimal arithmetic and gives a hex display program with a large character program. A list of 8K ROM entry points is also given (supplied by myself). Overall, there is enough to give a modest introduction to anyone who wants to find out just what is in the ZX81's monitor program. A further 11 pages disassembles the first half of the monitor program. This listing is not annotated, and the book's first printing contains a few disassembly errors.

The book will certainly do well. It gives any ZX81 owner plenty to work at. As a book, its overall balance is very good.

Ian Logan, Skellingthorpe, UK

Team 4 in the UK seem to know how to load old programs with new ROMs, via software. We'll track it down.

MX16-16K RAM
FOR USE WITH THE
SINCLAIR ZX80®

RAM MODULE
AND
POWER SUPPLY
$89.95 PLUS
$3.00 SHIPPING
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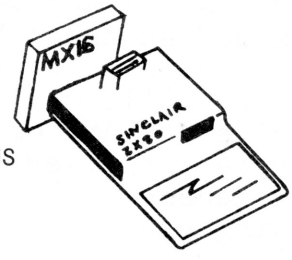


INSIGHT
1889 LEWIS DRIVE
NILES, MICHIGAN 49120
616-684-7868
M.C./CHECK/M.O./VISA/C.O.D.

8K/1K DIGITAL CLOCK

This program operates as a digital clock, showing A.M. or P.M. and changing at 12:00. To start the clock, run the program, enter A.M. or P.M. and enter the current time as a 3 or 4 digit number. For example, type 216 for 2:16 or 1005 for 10:05.

While the clock is running, you can move it back 1 minute by pressing the J key and up 1 minute by pressing the K key. Pressing D or F, the SLOW and FAST keys, will cause the clock to run slower or faster by 1/60th second per minute.

If you are fascinated enough to keep it running for days and make fast and slow adjustments, you may find that P differs from 3572. Type PRINT P to see its new value and change line 70.

Byte savers: Line 10, use shift W for OR. Line 30, key INPUT first, then cursor left and key PRINT, use shift W for OR.

R.F. Fraser-Smith, Chicago, IL

```
 10 PRINT "A.M. OR P.M."
 20 INPUT M$
 30 PRINT " INPUT TIME IN FORM
352 OR 1107"
 40 INPUT T
 50 LET H=INT (T/100)
 60 LET M=T-H*100
 70 LET P=3572
 80 CLS
 90 GOTO 200
100 LET M=M+1
110 IF INKEY$="F" THEN LET P=P-
1
120 IF INKEY$="D" THEN LET P=P+
1
130 IF INKEY$="J" THEN LET M=M-
2
140 IF M=60 THEN LET H=H+1
150 IF M=60 THEN LET M=0
160 IF H=13 THEN LET H=1
170 LET C$=M$
180 IF H=12 AND M=1 AND C$="A.M
." THEN LET M$="P.M."
190 IF H=12 AND M=1 AND C$="P.M
." THEN LET M$="A.M."
200 PRINT AT 21,18;H;".";M;" ";
M$;"  "
210 PAUSE P
220 POKE 16437,255
230 GOTO 100
```

Syntactic Sum: 30942, 8K

DEAR SINCLAIR RESEARCH

Here are 2 sides of a story we hear occasionally--owners' problems with the ZX80's reliability and technical support. This letter, edited for space, was sent to Sinclair. The reply was addressed to SYNTAX.--AZ

It is with great displeasure that I am returning my Sinclair ZX80. I awaited the ZX80's release for several years, confident that I would see another marvelous example of the synthesis of economy and power that have been the hallmarks of the Sinclair name. I must admit that I have been shown a computer with tremendous power and potential. But I have also been subjected to shoddy quality control and indifferent customer support.

Since I received my ZX80 in April, I have returned it twice for replacement (apparently Sinclair does not think it is worth repairing), had my 16K RAM module fail twice, and had fatal errors in the 8K BASIC ROM. The hardware failures were the direct result of being penny wise and pound foolish. I called Sinclair on numerous occasions and wrote twelve letters. My phone calls were futile. Sinclair answered 3 of my letters. The replies only proved my letters were not read. This disease--indifference--is destroying the customer support of many businesses.

I am, needless to say, bitter about my experience with Sinclair Research and suggest that you deal with these problems if you intend to stay in the personal computer field.

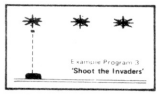
Lew Merrick, Lynnwood, WA

ZX80

JRS SOFTWARE

19 WAYSIDE AVENUE, WORTHING, SUSSEX, BN13 3JU
TELEPHONE WORTHING 65691 (Evenings and Weekends only)

ZX81



ZX80 - PROGRAMMABLE MOVING DISPLAY
(4K-ROM only)

Yes! This really is a **genuine** moving display, **not** another pause routine. If you want moving, flicker free displays *[and who doesn't]* then this is the program for you. The secret lies in the ZX80's ability to keep the display on your screen without the need to use all of the time available to it. Normally the ZX80 would be doing nothing during this spare time but the programmable moving display cleverly interupts to process your own instructions written in the simple but highly effective JRS numeric code. Great care has been taken so that the processing of your codes can always be interupted to return to the display routine at the precise microsecond that is required to ensure that your T.V. picture remains completely **rock-steady.**

Normally a true moving display on a ZX80 would take weeks to write and you would need to be an expert at machine-code programming. Now, at last, this program offers you the ability to write your own true moving displays in under an hour with no machine-code experience required whatsoever.

Cassette with 1k, 2k versions and 3 example programs plus FULL documentation **£4.95**

** Awarded top place in ZX80 software review * in* ***'YOUR COMPUTER'*** *October 1981 issue*

NEW - An ESSENTIAL addition to your 1K RAM ZX81 (or ZX80 8K ROM)

TOOLKIT (written by PAUL HOLMES)

Provides the following additional facilities:-

Line renumber — you state starting number and increment value.
Search and replace — changes every occurence of a character as you require.
Free space — tells you how many free bytes you have left

SPECIAL GRAPHICS ROUTINES

Hyper graphics mode — graphics never seen on a ZX81 before.
Open — instantly sets up as many empty print lines as you require.
Fill — used in conjunction with OPEN fills your screen instantly with your specified character
Reverse — changes each character on your screen to its inverse video.

TAPE ROUTINE — provides a system **WAIT** condition until a signal is received in the cassette ear jack — many uses !

All these routines are written in machine code and together take up only 164 BYTES of your precious RAM - an incredible achievement!!

The price is incredible too! ONLY **£3.95** for cassette, including FULL instructions and example programs.

ALSO available 16K version ONLY **£4.95** which includes all the above PLUS:-
GOTO's and GOSUB's included in line renumber.
Search for and list every line containing specified character.

ZX81 2K programs SLALOM and BLACK HOLES now available as listings only £1.25 each, £2 for both.

OVERSEAS CUSTOMERS PLEASE NOTE Payment must be made in Sterling by International Money Order (available at your bank) Please add 50 pence to cover overseas postage.

Nigel Searle of Sinclair replies:

Mr. Merrick did not get an individual reply to a letter requesting technical information. It is unfortunately the case that when we sell a product for as little as $100 that we are unable to offer a great deal of technical support. We give a very substantial amount of information in our advertisements and are content for people to make up their minds based on that information whether to purchase our product or not. The computers come with a substantial operating manual and mail order customers may return the unit and receive a full refund if they are dissatisfied with the documentation provided or for any other reason.

If we answered specifically all individual questions we receive by telephone and letter from owners of our computers, we would certainly either go out of business or have to raise our prices very substantially. I believe we have the right to determine the level of technical support we are willing to give our product. We do fully accept the obligation to live up to any promises in our advertising about our money-back offer to mail order customers and our 90-day repair or replacement policy.

Mr. Merrick says his 8K ROM contains faults and we told him nothing about how we are going to fix it. You know that this is not true. We have made perfectly clear to anyone who has asked that we will replace faulty 8K ROMs at no charge.

Mr. Merrick complains that his ZX80 and 16K RAM have had to be replaced a total of 3 times between them. He remarks that his ZX80 was replaced with a new unit when it was returned. Obviously, if we had to replace every ZX80 owner's computer with 2 new computers, we would not stay in business very long. We have sold almost 50,000 computers in the United States alone. Even assuming that only 2% of our computer fail in use, simple mathematics tell us that there are regrettably no fewer than 20 people who have had to be sent 2 replacements for their original machine. Obviously this is of little consolation to those affected, but is the inevitable result of large unit sales and a non-zero failure rate.

Nigel Searle, Sinclair Research

IMPROVED 4K SINE CALCULATION

Use these lines in 4K programs requiring sines between 0 and 90 degrees. X is the angle; S is its sine. This equation produces error less than 2E-03.

```
 LET S=(179*X-((((251*X)/100)*X)
/10)-((((((56*X)/20)*X)/100)*X)/
5))/10
 IF X>35 AND X<65 THEN LET S=S+2
 PRINT "SIN ";X;" DEG= ";S; " E-03"
```

Brian O'Brien, Weston, MA

4K/1K REVERSE

The object of this game, rewritten from one published by Creative Computing, is to get the numbers in ascending order from left to right. When the computer asks for number to reverse, enter how many numbers from left to right you wish to reverse. For example:

```
 YOUR LIST IS NOW:
 2 3 4 5 1 6 7 8 9
```

Reversing 4 numbers gives you:

```
 5 4 3 2 1 6 7 8 9
```

Now reversing 5 numbers will win:

```
 1 2 3 4 5 6 7 8 9
```

Line 30 sets N=9. The computer accepts only numbers between 0 and N. To change the length of the list, change N in line 30. If you enter 0 the computer sets up a new list (line 250). You can change line 250 to 250 IF R=0 THEN STOP so entering 0 ends the program.

Bill Eckel, Omaha, NE

```
  30 LET N=9
  40 DIM A(N)
  50 LET T=0
 100 LET A(1)=RND(N-1)+1
 110 FOR K=2 TO N
 120 LET A(K)=RND(N)
 130 FOR J=1 TO K-1
 140 IF A(K)=A(J) THEN GO TO 120
 150 NEXT J
 160 NEXT K
 210 GO SUB 600
 220 PRINT
 230 PRINT "NO. TO REVERSE"
 240 INPUT R
 250 IF R=0 THEN GO TO 50
 260 IF R=N OR R<N THEN GO TO 30
0
 265 PRINT
 270 PRINT "OOPS TOO MANY"
 280 GO TO 240
 300 LET T=T+1
 310 FOR K=1 TO R/2
 320 LET Z=A(K)
 330 LET A(K)=A(R-K+1)
 340 LET A(R-K+1)=Z
 350 NEXT K
 360 GO SUB 600
 400 FOR K=1 TO N
 410 IF NOT A(K)=K THEN GO TO 22
0
 420 NEXT K
 500 PRINT
 505 PRINT
 510 PRINT "YOU WON IN ";T;" MOV
ES"
 520 PRINT
 530 PRINT "TRY AGAIN? (Y OR N)"
 540 INPUT A$
 550 IF A$="Y" THEN GO TO 50
 555 PRINT
 560 PRINT
 565 PRINT
 568 PRINT
 570 PRINT ,"OK HOPE YOU HAD FUN
"
 580 STOP
 600 CLS
 605 PRINT
 610 PRINT ,"REVERSE"
 620 PRINT
 630 PRINT
 640 PRINT "YOUR LIST IS NOW:"
 650 PRINT
 660 PRINT
 670 FOR K=1 TO N
 680 PRINT " ";A(K);
 690 NEXT K
 700 PRINT
 705 PRINT
 710 RETURN
```

Syntactic Sum: -13568, 4K

CHANGES TO RUN REVERSE ON 8K ROM

Reverse will not fit in 1K RAM on an 8K machine. With larger RAM sizes, change these lines:

```
 100 LET A(1)=INT (RND*10)
 120 LET A(K)=INT (RND*10)
 260 IF R<=N THEN GOTO 300
 310 FOR K=1 TO INT R/2
```

You can also change the many empty PRINT lines (used in 4K machines to arrange the display) to fewer PRINT AT statements. To avoid getting 0 in your list, add:

```
 105 IF A(1)=0 THEN GOTO 100
 125 IF A(K)=0 THEN GOTO 120
```

To run in 8K with only 1K of RAM, try deleting the empty PRINT statements and "user-friendly" lines (like 520-570).--AZ

BEGINNERS' COLUMN: REM REVISITED

In January we saw that REM statements in BASIC are used to insert comments, or REMarks for the programmer's benefit. The computer ignores anything in a REM statement when running the program.

Why, then, do some BASIC programs contain a REM statement at the beginning followed by garbage? This REM statement differs from one holding remarks; it holds machine language (ML) in a BASIC program. This method allows you to save and load ML programs. When you see a REM statement at the beginning of a BASIC program with nonsense after it, it's part of a ML program.

As we saw in the Jun.81 column on PEEK and POKE commands, you can direct the computer to put a number at a specified address, or RAM location. (RAM is random-access memory, or where the computer stores what you type in.)

ML programmers POKE machine code into REM statements. This way they can use a single line rather than separate POKE lines. You can POKE the numbers that comprise a ML program (see Beginners' Loading ML Programs, Aug.81). A USR call (a line using the BASIC command USR) tells the computer to go to the specified address and execute what it finds there. The ML programmer knows the location of the ML program and uses the USR call to send the computer there. Here's how to figure out the first address:

All BASIC programs start at a fixed address--16424 in a 4K ROM ZX80 (p.123 of ZX80 manual) and 16509 in an 8K ROM machine (p.171 of Sinclair 8K manual). Each line

THE ZX80 BOOKSHELF LIBRARY OF CASSETTES

This attractive bookshelf folder (blue vinyl exterior, black interior) contains a library of six Lamo-Lem 4K ROM cassettes, each held firmly within a slot in the folder. Cassettes snap in and out with finger pressure. The 9¾ by 9¼ by ¾" folder stores your library of cassettes easily and compactly on a bookshelf. It includes the following cassette packages:

THE ZX80 HOME COMPUTER PACKAGE

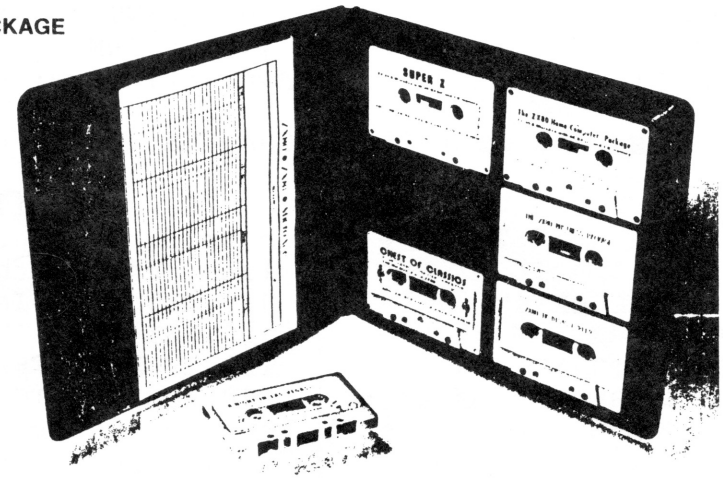
Etch-A-Screen
Electronic Billboard
Composer
Calculator
Checkbook Balancer

THE CHEST OF CLASSICS

Lunar Lander
K-Trek
Life
Mindmaster

A NIGHT IN LAS VEGAS

Blackjack
Roulette
Craps
Slot machine



THE ZX80 BUSINESS PACKAGE

Search & Save
VideoComp-4
VideoGraph

ZX80 1K DISASSEMBLER

Disassembler Program
Memory Test

SUPER Z

(Adds 7 new BASIC statements)
The Super Z Program
A Super Z Module
A Super Z Demonstration

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number, regardless of the number of digits, uses 2 bytes in the 4K machine and 4 bytes in the 8K machine. Each byte occupies 1 memory location.

Each keystroke after the line number uses exactly 1 byte. So REM is stored in address 16426 when it is the first word of the first line of a 4K machine and 16513 on an 8K machine. The first ML command will be in the byte after REM.

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SYNTAX ZX80 invites you to express opinions related to the ZX80 and the newsletter. We will print, as space allows, letters discussing items of general interest. Of course, we reserve the right to edit letters to a suitable length and to refuse publication of any material.

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SYNTAX ZX80 is published monthly by a wholly-owned subsidiary of The Harvard Group.

Syntax ZX80, Inc.
RD 2, Box 457, Harvard, MA 01451.
Telephone 617/456-3661.
12 issues, $29. Single issue, $4.

Publisher: Kirtland H. Olson
Editor: Ann L. Zevnik

Printed by Joseph E. Marhefka, Jr.
Clinton Offset Printers
Clinton, MA 01510

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ISSN 0273-2696

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ZX81-1

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